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The ground experiment for development of Multi Image X-ray Interferometer Modules

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We propose a new type of astronomical X-ray interferometer without using mirrors. The structure is very simple, consisting of an X-ray absorption grating and an X-ray spectral imaging detector. Quasi-parallel light from a celestial object passing through the grating makes a self-image of the grating by the Talbot effect. Stacking the image with the grating pitch in the analysis provide the profile of the X-ray object. The angular resolution of the system can be arcseconds or sub-arcseconds, which are difficult to be achieved X-ray mirror systems for satellites. We call this interferometer system Multi Image X-ray Interferometer Module (MIXIM). We started an experiment using a micro-focus X-ray source, and 4.8 μm pitch 17 μm thick Au X-ray absorption grating, and an XRPIX2b detector with a pixel size of 30 μm. We employed charge sharing analysis to achieve finer positional resolution than the pixel size and detected the interference fringes with a magnification factor of 4.4. Our final goal is, however, parallel X-rays from celestial objects, and thus detectors with finer or comparable position resolution as the grating pitch is required. To meet this requirement, we have recently introduced a CMOS sensor developed by Gpix inc. with a small pixel size of 4.25 μm. This device is designed for visible light application, but we irradiated X-rays and find sensitivity for them. We present the current status of these preliminary experiments for MIXIM.

Primary author: KAWABATA, Tomoki (Osaka University)

Co-authors: Dr HAYASHIDA, Kiyoshi (Osaka University); Mr HANASAKA, Takashi (Osaka University); NAKAJIMA, Hiroshi (Osaka University); HOSONO, Ryo (Osaka University); Dr SHIMURA, Takayoshi (Osaka University); Mr KURUBI, Hiroyuki (Osaka University); INOUE, Shota (Osaka university); Prof. TSUNEMI , Hiroshi (Osaka University); Prof. MATSUMOTO, Hironori (Osaka University)

Presenter: KAWABATA, Tomoki (Osaka University)

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